



Attorney Docket No. 0756-2358

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:

Shunpei YAMAZAKI

Serial No. 09/939,767

Filed: August 28, 2001

For: SEMICONDUCTOR DEVICE AND  
METHOD OF FABRICATING SAME

) Group Art Unit: 2813

) Examiner: D. Hogans

) CERTIFICATE OF MAILING) I hereby certify that this correspondence is  
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Commissioner for Patents, P.O. Box 1450,  
Alexandria, VA 22313-1450, on March 16,  
2004.

RESPONSEHonorable Commissioner of Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

The Official Action mailed December 16, 2003, has been received and its contents carefully noted. This response is filed within three months of the mailing date of the Official Action and therefore is believed to be timely without extension of time. Accordingly, the Applicant respectfully submits that this response is being timely filed.

The Applicant notes with appreciation the consideration of the Information Disclosure Statement filed on August 28, 2001.

Claims 1-3, 5-7 and 35-73 are pending in the present application, of which claims 1, 35, 42, 47, 54 and 58 are independent. Claims 62-73 have been withdrawn from consideration. Accordingly, claims 1-3, 5-7 and 35-61 are currently elected, of which claims 1, 35, 42, 47, 54 and 58 are independent. For the reasons set forth in detail below, all claims are believed to be in condition for allowance. Favorable reconsideration is requested.

Paragraph 4 of the Official Action rejects claims 1, 3, 5, and 6 as obvious based on JP 408213317 to Yamazaki et al. The Applicant respectfully traverses the rejection because the Official Action has not made a *prima facie* case of obviousness.

As stated in MPEP §§ 2142-2143.01, to establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. "The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art." In re Kotzab, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000). See also In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); In re Jones, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

The prior art, either alone or in combination, does not teach or suggest all the features of the independent claims. The Official Action asserts that Yamazaki '317 teaches "a heat resistant gate electrode (407)" (page 3, Paper No. 15). The Applicant respectfully disagrees and traverses the above assertion in the Official Action.

Yamazaki '317 teaches using aluminum to form the gate electrode 407. As noted in Yamazaki '317, aluminum diffuses from the gate electrode 407 at a temperature of 450 °C or more (see paragraph [0029]). As such, a heat-treatment process in Yamazaki '317 "cannot be performed at the temperature of 450 degrees C or more" (Id.). This citation shows that the gate electrode of Yamazaki '317 is not a heat resistant gate electrode. In contrast, according to the specification of the present application, gate electrodes made of tantalum and titanium are examples of heat resistant gate electrodes (see page 2, lines 26-27 and page 6, lines 5-7). A heat

resistant gate electrode in the present application means, for example, a gate electrode made of a material which has almost the same heat resistance as or more heat resistance than tantalum or titanium. Therefore, Yamazaki '317 does not teach or suggest a heat resistant gate electrode, as characterized by the specification and claims of the present invention.

Further, the Official Action asserts that Yamazaki '317 "teaches a nickel concentration in the source/drain regions that is at least one order of magnitude higher than a concentration of nickel in other regions" (page 4, Paper No. 15). The Applicant respectfully disagrees and traverses the above assertion in the Official Action.

Although the Official Action cites paragraphs 10-45 and Figures 1-6 of Yamazaki '317 for support of the above assertion, the Applicant has not found a teaching in Yamazaki '317 which supports the assertion. Although paragraph [0029] of Yamazaki '317 appears to teach that "the nickel element contained to the crystallized field 202 is spread to the field 203" and making a "nickel concentration of the crystallized field 202 1/2 or less," this is not the same as a concentration of a crystallization promoting material in a source region and a drain region formed in an active layer being higher than a concentration of the crystallization promoting material in other regions in the active layer by at least one order of magnitude. Therefore, the Applicant respectfully submits that Yamazaki '317 does not teach or suggest that a concentration of a crystallization promoting material in a source region and a drain region formed in an active layer is higher than a concentration of the crystallization promoting material in other regions in the active layer by at least one order of magnitude, much less two or more orders of magnitude.

Since Yamazaki '317 does not teach or suggest all the claim limitations, a *prima facie* case of obviousness cannot be maintained. Accordingly, reconsideration and withdrawal of the rejections under 35 U.S.C. § 103(a) are in order and respectfully requested.

Paragraph 5 of the Official Action rejects claims 2, 7 and 54-57 as obvious based on the combination of Yamazaki '317 and U.S. Patent No. 5,459,090 to Yamazaki et al. There is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify Yamazaki '317 and Yamazaki '090 or to combine reference teachings to achieve the claimed invention.

The Official Action concedes that Yamazaki '317 does not teach a gate electrode comprising tantalum (page 5, Paper No. 15). The Official Action relies on Yamazaki '090 to allegedly teach the above-referenced feature. The Official Action asserts that "[it] would have been obvious to one of ordinary skill in the art to modify [Yamazaki '317] by incorporating a gate electrode comprised by tantalum, as taught by [Yamazaki '090], to lower the resistivity of the gate electrode" (Id.). The Applicant respectfully disagrees and traverses the above assertion in the Official Action.

The Official Action has not provided any citation from either Yamazaki '317 or Yamazaki '090 to support the above assertion. In fact, it is well known that the resistivity of aluminum is lower than that of tantalum (see attached Table 4.2.1.1, "electric resistivity of metal at room temperature," American Institute of Physics (AIP) Handbook, 3<sup>rd</sup> Ed. 9 (1972) 39, McGraw-Hill). As such, Yamazaki '090 teaches away from the alleged motivation suggested by the Official Action. Therefore, it would not have been obvious to one of ordinary skill in the art at the time of the invention to combine Yamazaki '317 with Yamazaki '090.

Even assuming motivation could be found, the Official Action has not given any indication that one with ordinary skill in the art at the time of the invention would have had a reasonable expectation of success when combining Yamazaki '317 and Yamazaki '090.

The Applicants further contend that even assuming, *arguendo*, that the combination of Yamazaki '317 and Yamazaki '090 is proper, there is a lack of suggestion as to why a skilled artisan would use the proposed modifications to achieve the unobvious advantages first recognized by the Applicants. The mere fact that

references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination.

In the present application, it is respectfully submitted that the prior art of record, alone or in combination, does not expressly or impliedly suggest the claimed invention and the Official Action has not presented a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references.

For the reasons stated above, the Official Action has not formed a proper *prima facie* case of obviousness. Accordingly, reconsideration and withdrawal of the rejections under 35 U.S.C. § 103(a) are in order and respectfully requested.

Paragraph 6 of the Official Action rejects claims 35-41 as obvious based on the combination of Yamazaki '317, Yamazaki '090, and U.S. Patent No. 5,764,321 to Koyama et al.

Koyama does not cure the deficiencies in Yamazaki '317 and Yamazaki '090. The Official Action relies on Koyama to allegedly teach "a laminate structure (311) of silicon nitride and polyimide" (page 7, Paper No. 15). Yamazaki '317, Yamazaki '090 and Koyama, either alone or in combination, do not teach or suggest a heat resistant gate electrode or that a concentration of a crystallization promoting material in a source region and a drain region formed in an active layer is higher than a concentration of the crystallization promoting material in other regions in the active layer by two or more orders of magnitude. Since Yamazaki '317, Yamazaki '090 and Koyama do not teach or suggest all the claim limitations, a *prima facie* case of obviousness cannot be maintained.

Also, Koyama does not cure the deficiencies in the alleged motivation to combine Yamazaki '317 and Yamazaki '090. Koyama does not show that it would not have been obvious to one of ordinary skill in the art at the time of the invention to combine Yamazaki '317 with Yamazaki '090.

Accordingly, reconsideration and withdrawal of the rejections under 35 U.S.C. § 103(a) are in order and respectfully requested.

Paragraph 7 of the Official Action rejects claims 42, 44 and 46 as obvious based on the combination of Yamazaki '317 and U.S. Patent No. 5,426,064 to Zhang et al.

Zhang does not cure the deficiencies in Yamazaki '317. The Official Action relies on Zhang to allegedly teach "that  $1 \times 10^{17}$  atoms/cm<sup>3</sup> of nickel is needed in an amorphous layer to promote crystallization of silicon" (page 9, Paper No. 15). Yamazaki '317 and Zhang, either alone or in combination, do not teach or suggest a heat resistant gate electrode or that a concentration of a crystallization promoting material in a source region and a drain region formed in an active layer is higher than a concentration of the crystallization promoting material in other regions in the active layer by two or more orders of magnitude.

Also, independent claim 42 recites a concentration of a crystallization promoting material of less than  $5 \times 10^{16}$  atoms/cm<sup>3</sup>. In contrast, Zhang teaches that "if the concentration of [catalytic metal] elements is in excess of  $1 \times 10^{17}$  cm<sup>-3</sup>, favorable results are obtained" (column 1, lines 62-65). Therefore, Yamazaki '317 and Zhang do not teach or suggest a concentration of a crystallization promotion material of less than  $5 \times 10^{16}$  atoms/cm<sup>3</sup>.

Since Yamazaki '317 and Zhang do not teach or suggest all the claim limitations, a *prima facie* case of obviousness cannot be maintained. Accordingly, reconsideration and withdrawal of the rejections under 35 U.S.C. § 103(a) are in order and respectfully requested.

Paragraph 8 of the Official Action rejects claims 43, 45 and 58-61 as obvious based on the combination of Yamazaki '317, Zhang and Yamazaki '090. Paragraph 9 of the Official Action rejects claims 47, 49, and 51-53 as obvious based on the combination of Yamazaki '317, Zhang and Koyama. Paragraph 10 of the Official Action rejects claims 48 and 50 as obvious based on the combination of Yamazaki '317, Zhang, Yamazaki '090 and Koyama. For the reasons stated above, Yamazaki '317,

Zhang, Yamazaki '090 and Koyama, either alone or in combination, do not teach or suggest all the features of the present invention.

Should the Examiner believe that anything further would be desirable to place this application in better condition for allowance, the Examiner is invited to contact the Applicant's undersigned attorney at the telephone number listed below.

Respectfully submitted,



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#### 4.2.1.1 単体金属の常温における電気抵抗率<sup>1)</sup>

electric resistivity of metal  
at room temperature

[illegible]

$\rho$  は  $[\mu\Omega \cdot \text{cm}]$  の単位で示される。  
最近の別測定値がある場合には ( )  
で示す。

La	Ce	Pr	Nd	Pm	Sm	Eu
75 (82.4)	79 (76.7)	64	56.5		95.88	86
79	81	67	59		99	89
Ac	Th	Pa	U	Np	Pu	Am
	14.0 (13)		20	116	144	
	15		21	118.5	143	

1) 主として "American Institute of Physics (AIP) Handbook", 3rd ed. 9 (1972) 39, McGraw-Hill による。

He																	Ne	F	O	N	C	B											
Ar																	Ar	Cl	S	P	Si												
Kr																	Kr	Br	Se	As	Ge	Ga	Zn	Cu	Ni								
																				26		13.65	5.65	1.55	6.20								
																				29		14.85	6.17	(1.545)	7.04								
Xe																	Xe	I	Te	Sb	Sn	In	Cd	Ag	Pd								
																				37.6	~10	8.0	6.73	1.47	9.70								
																				41.3	~11	8.75	7.28	1.61	10.55								
Rn																	Rn	At	Po	Bi	Pb	Tl	Hg	Au	Pt								
																			42	105	19.3	15	94.1	2.01	9.59								
																			46	116	(19.2)	16.4	95.9	2.20	10.42								

Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
127.5	109	87.5 (56)	74.5	77	58		49
134.1	111	90	77.7	81	62		53
Cm	Bk	Cf	Es	Fm	Md	No	Lr

## Reference 2